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Regulatory reform of the QLD sugar industry

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Presentation at the Melbourne CGE workshop

September 2004

OESR: Knowledge Leaders for Smarter Decision Making

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Overview

- Background on OESR's analysis of Sugar industry regulatory reform
- Adapting (modifying) QGEM to address the policy issue
- Methodology
  - PE inputs => inputs for SR
  - SR scenario => inputs for LR
  - LR scenario

Sugar industry example

- Background to this policy issue
  - Centre of International Economics -2002
- The policy scenario
  - 20% increase in cane yields
  - Abolishing cane production area system
  - Potential 30 week milling system
  - 20% reduction in harvesting costs
  - 10% reduction in cane transport costs

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Policy analyst's role

1. Interpreting the policy question
2. Choosing a model
3. Setting up the model
4. Calculating shocks
5. Running simulations and interpreting results
6. Writing reports and delivering presentations

Critical policy features

- Measures of economic impact
- Identifying the structure of sugar sector
- Regulations affecting the sugar sector
- Conceptual viewpoint on suitability of CGE model for the policy issue

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Need for CGE analysis?

- Why NOT just rely on PE modelling?
- Take PE results and impose on CGE by endogensing Supply and Demand relationships
- Take initial PE shocks and impose on CGE using our Supply and Demand relationships
- Hybrid-approach

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Modifications to QGEM

- Disaggregation of industry detail
- Add a ‘Top-down’ procedure (MRES)
- Modelling methodology
  - Incorporating PE outputs as simulation inputs to QGEM
  - Incorporating QGEM results from one simulation as inputs to another simulation

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Industry disaggregation

- Separated out 4 new industries and commodities (H,SC,SM,R)
- This modification to the database provides several benefits
  - Provides data on the commodity flows & input structures that exactly matches the CIE data
  - Supports an industry structure that will allow us, once we have the theory, to model which agent acquires the benefit from each individual piece of the regulatory changes

MRES procedure

- MRES provides a theoretical structure that will support our goal of using the spatial breakdown of PE results for the various sugar-related industries
- Appendix B, Table B1
  - List of Statistical Divisions
  - Split of targeted & non-targeted Div's
  - List of Sugar industries targeted for each Div (Harvesting, Sugar Cane farming, Sugar Milling, Refining)

Modelling methodology

- Modification in what sense?
  - Using information from PE to switch off various supply and demand relationships
- Addresses two key requirements
  - Incorporate external productivity estimates
  - Appropriate treatment to allocate income flows to factors of production and between vertically-integrated chain

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Results determined by?

- PE data incorporated into QGEM simulations
- Our methodology for incorporating this PE data
- QGEM's theoretical structure and database

Modelling methodology

- Two simulations
- Differentiated by our choice of closure
- The SR policy scenario closely resembles the PE analysis
- The LR policy scenario still draws heavily on the PE analysis but allows nominal values to vary according to relationships determined in QGEM

Shortrun simulation (p19)

- Start with SR closure (Section 3.4)
- Determine PE data to be used as QGEM targets (Table 1)
- Reversing MRES to import the PE model's spatial detail
- Decide which component of QGEM's theoretical structure needs to be 'switched-off' for each PE target value

Table 1: CIE results incorporated into QGEM

QGEM component	% Change
Queensland Harvesting Industry	
Harvesting costs	-20.00
Queensland Sugar Cane Growing Industry	
Output	52.87
Land quantity	25.33
Land productivity[a] (yield)	-21.97
Payments to labour	27.84
Labour productivity[a]	-35.74
Capital quantity	25.33
Transport costs between the Sugar Cane and Sugar Milling Industries[a]	-10.00
Queensland Sugar Milling Industry	
Quantity of foreign exports	62.80
Payments to labour	41.28
Labour productivity[a]	-22.98
Capital quantity	21.33
Capital productivity[a]	-2.89

Shortrun simulation -3

- Table C1 provides full list of swaps
- Swaps common to all Sugar-related IND's
  - Exogenise DIV output targets achieved by targeting (n-1) Div's; and
  - Endogenising automatic link to State total
  - Exogenise switch that forces State result to be weighted sum of DIV results; and
  - Endogenise automatic link to National industry output
  - this allows us to target regional activity story provided by the CIE

```
E_z_div_A #
Output of national industries at Statistical divisions #
(All,j,NATIND_DIV)(All,d,STATDIV)

z_div(j,d) = z(j,"QLD") + ff_z_div(j) + f_z_div(j,d)  ;

SWAP z_div = f_z_div ;
```

```
E_dsum_nat
# Adding up rule for loc-nat industries:
  dsum_nat normally end. and zero #
(All,j,NATIND_DIV)

dsum_nat(j) = z(j,"QLD") -
Sum(d,STATDIV, DIVSHR(j,d)*z_div(j,d)) ;

SWAP dsum_nat = ff_z_div ;
```

Shortrun simulation -5

- Sugarcane Harvesting
  - Exogenise basic price (-20%)
  - Endogenising all-input technical chg
  - Note that this allows us to target Harvesting efficiency changes passed onto Sugar-farmers identified by the CIE

Shortrun simulation -6

- Sugarcane Farming example
  - Output targets by Statistical Division achieved by targeting (n-1) divisions and endogenising State total
  - Endogenisng demand for sugarcane which normally would be determined via demand for Sugar Milling output (SM intermediate-input tech chg)
  - Note that this allows us to target Sugar Mill efficiency changes CIE identified

Shortrun simulation -7

- Sugarcane Farming
  - Employment target achieved by endogenising labour productivity
  - Target for factor returns to labour achieved by switching-off standard QGEM wage-pricing rule to allow divergence from other industries
  - Note that we are targeting Quantify and Value of labour identified by the CIE

Shortrun simulation -8

- Mechanical task of running simulation and recording results (including the endogenised variables which will be switched in the LR simulation)
- Sugarcane farming example
  - PE employment target of 11.09% achieved via endogenous 21.97% improvement in labour productivity

Longrun simulation -1

- Start with LR closure (section 3.4)
- Decide which component of QGEM's theoretical structure needs to be 'switched-off' for each PE target value
- For the LR we believe QGEM is better suited, than PE model, to estimate
  - Some elements of sugar industries
  - Impacts on broader economy

Longrun simulation -2

- Still targeting real variables identified in PE model
- Allowing nominal value to vary in accordance with CGE relationships
  - Take endogenously determined supply and demand shifts from SR
  - Impose as shocks in the LR simulation allowing ‘traditional’ endogenous variables to be determined by QGEM

Longrun simulation -3

- Table C3 provides list of swaps where:
- variable was ENDOGENOUSLY determined in Short Run simulation
- variable is EXOGENOUS and shocked in Long Run simulation
- Long Run shock value determined in the SR simulation

Longrun simulation -4

- Swaps targeting SR values
  - Harvesting: Exogenise all-input tech chg (SR p0a)
  - Sugarcane Farming: Exogenise Labour saving tech chg Endogenising employment (allowing exit from the industry for those owner-occupiers who don't have LR profitability)
  - Sugar Milling: Exogenise Labour saving tech chg (SR employment)
  - Sugar Milling: Exogenise Capital saving tech chg (SR capital rentals)

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Conclusion

- Two simulations approach allowed OESR to make use of PE analysis
- LR sim allows CGE to determine economic chgs in wider economy whilst incorporating sufficient endogeneity to allow the econony-wide effects to have feedback effects on sugar-industries
- SR raw sugar price (p0a = -2.68%)
- LR raw sugar price (p0a = -3.62%)

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